



MFS-V3:

The future of wire feeding in
laser welding and brazing!





MFS-V3 represents the wire feeding of the future in laser welding and brazing!

A living concept – for technological advancement!

Constructive teamwork:

In co-operation with leading car manufacturers and ABICOR BINZEL ROBOTIC SYSTEMS, the specific requirements of laser and arc processes in vehicle construction were analysed.

The result of this is a fully digitally controlled, high-precision wire feeding system that is optimally geared to the high demands of the respective production environment in every respect: MFS-V3 – the third-generation master feeder system with completely redeveloped eBOX and service software.

The MFS-V3 is used in laser-based joining processes with welding filler metal or braze for relatively small process windows. It is ideal particularly for applications which require high connection strength and finish quality and which allow little or no reworking. The system feeds even critical welding filler metals optimally and reliably. Thus, it also allows the integration of special wire electrodes into automated series production and ensures technological advancement in the long term.

MFS-V3 in brief:

■ Precise & dynamic

- Independently digitally controlled motors, whereby no synchronisation is necessary
- Fast motor control due to 32-bit processor
- High accuracy even at very low wire feeding speeds

■ Reliable processing & easy to install

- Proportional speed control
- Control system: analogue, digital or by fieldbus
- Automatic master pull or push-push recognition (with MF1 and MF1-Rear)
- Wide-range input
- Compatible with MFS-V2

■ User-friendly & low-maintenance

- Licence-free service software for visualisation, documentation, diagnostics and maintenance
- Job mode selectable (64 jobs)
- Programming of maintenance intervals
- Optionally available with safety shutdown and inching function

The muscles:
Optional additional drive as "M-DRIVE" or "MF1-Rear"

The heart:
"MF1" front drive

The nervous system:
"MFS service software"

The brain:
"eBOX V3" control

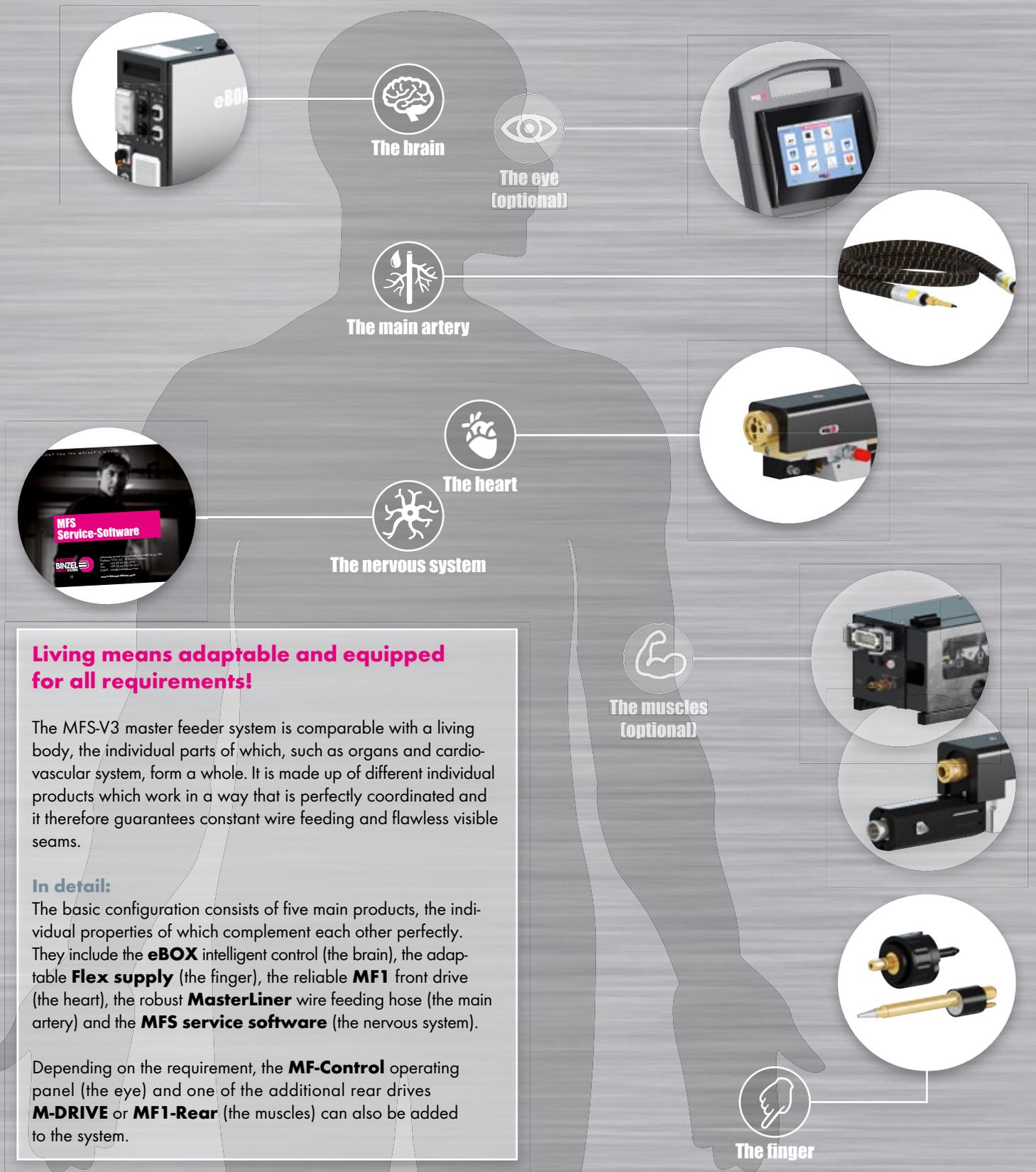
The main artery:
"MasterLiner" wire feeding hose

The eye:
"MF-Control" operating panel

The finger:
"Flex supply"



The living concept at a glance: MFS-V3 wire feeding system



Living means adaptable and equipped for all requirements!

The MFS-V3 master feeder system is comparable with a living body, the individual parts of which, such as organs and cardiovascular system, form a whole. It is made up of different individual products which work in a way that is perfectly coordinated and it therefore guarantees constant wire feeding and flawless visible seams.

In detail:

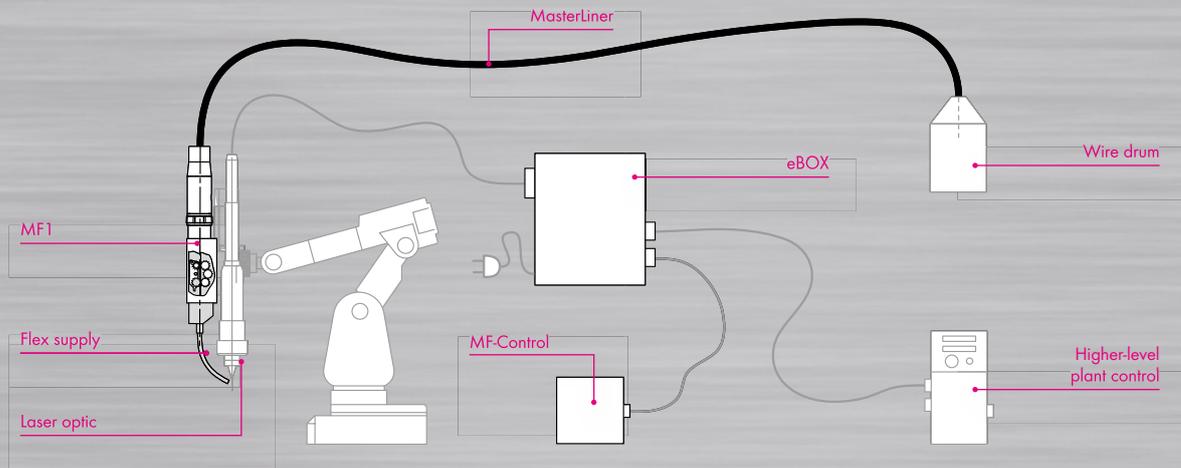
The basic configuration consists of five main products, the individual properties of which complement each other perfectly. They include the **eBOX** intelligent control (the brain), the adaptable **Flex supply** (the finger), the reliable **MF1** front drive (the heart), the robust **MasterLiner** wire feeding hose (the main artery) and the **MFS service software** (the nervous system).

Depending on the requirement, the **MF-Control** operating panel (the eye) and one of the additional rear drives **M-DRIVE** or **MF1-Rear** (the muscles) can also be added to the system.

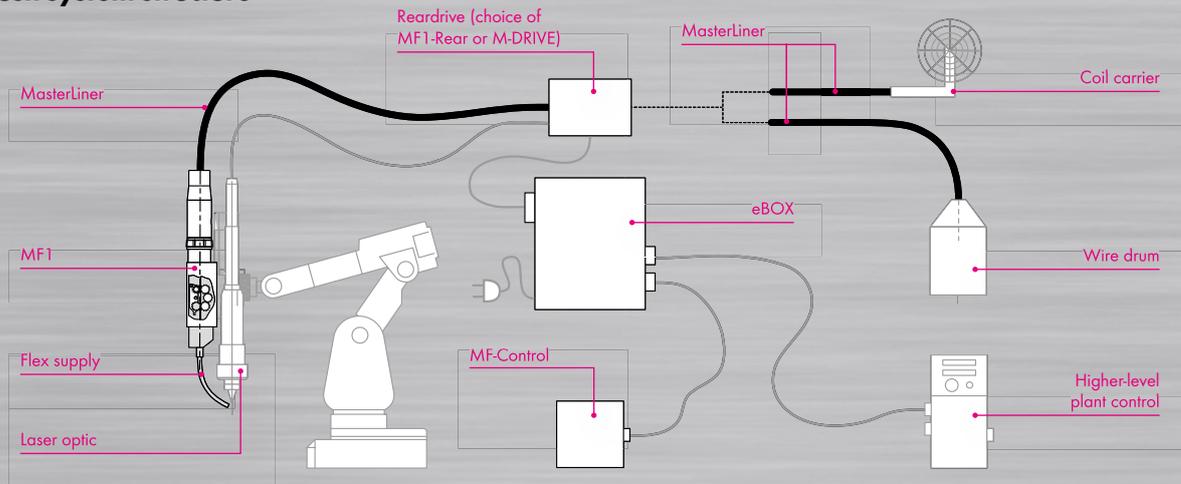
The living concept

The system structure: Operating modes master pull and push-push

Master pull system structure



Push-Push system structure



MFS-V3 operating modes:

The operating mode is selected and coordinated individually depending on the requirement, to guarantee a reliable process.

Basically, the MFS-V3 can be operated in two different structures: either as a master pull system with one drive or as a push-push system with two drives.

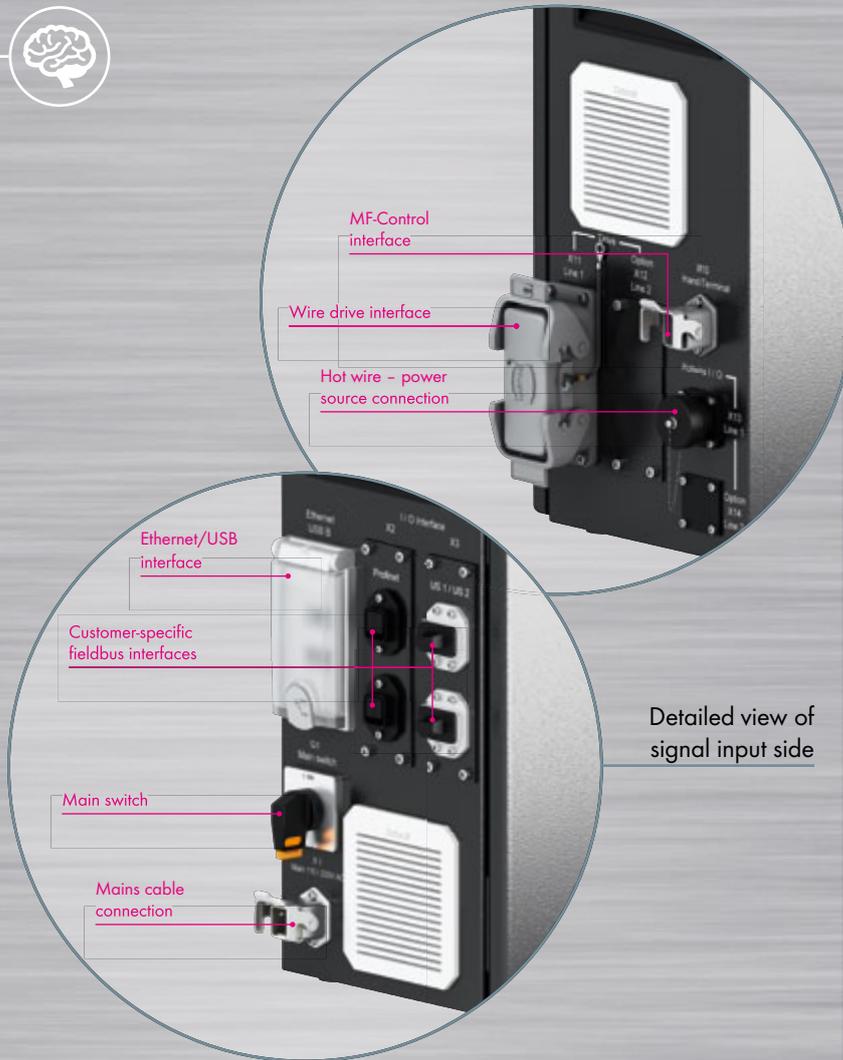
Master pull system properties:

- Works with only one drive (MF1)
- Suitable for wire feeding of CuSi, steel and stainless steel wires (Ø 0.8 - 1.6 mm)
- For short wire feeding distances
- Ideal for wire feeding from the wire drum
- Cost-effective due to minimal stocking of wear and spare parts

Push-push system properties:

- Works with two drives
- For reliable feeding of all wire materials (Ø 0.8 - 1.6 mm)
- Particularly suitable for soft wires such as aluminium, as no tensile forces occur on the wire
- For long wire feeding distances
- Wire can be fed either from the wire drum or from the coil carrier
- No synchronisation of the drives necessary
- With wire buffer function

The brain: "eBOX" control – The nerve centre of the systems



Detailed view of
signal output side



Detailed view of
signal input side

Future-proof & reproducible

In the third generation of the master feeder system, a comprehensive new development of the eBOX control unit has been used to meet the complex requirements of wire feeding in laser applications. The result is a completely reworked and optimised eBOX with modular and precisely co-ordinated components. As the nerve centre of the system, it is ideally equipped for the ever-increasing requirement profile in laser applications – particularly in car manufacturing – all over the world.

The eBOX represents the communication interface between the higher-level plant control and the wire drives of the MFS-V3. It houses all the electronic control elements and is available as an analogue/digi-

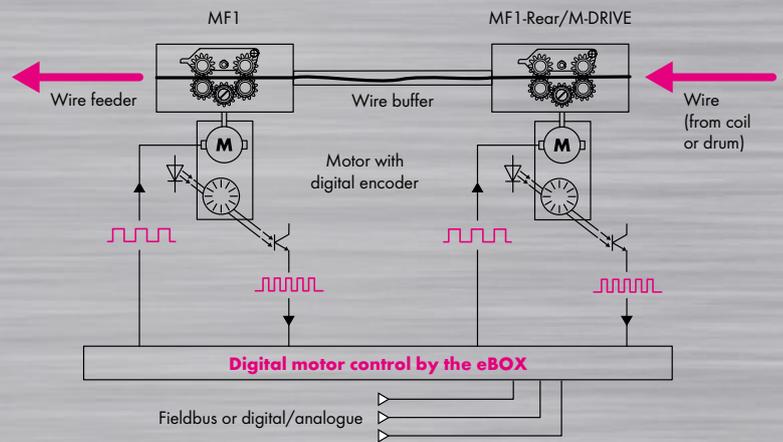
tal version and digitally for various fieldbus systems/interfaces.

Fully digital control circuits as well as consistent separation of logic (Multibus I/O board) and drive technology (axis controller) ensure that individual system components are reproducible in the case of servicing and can be replaced without further adaptation. Time-consuming calibration of analogue tachometer systems or other components therefore belong to the past: fully digital control for a future-proof system.

Picture:

Digital drive control circuit

- Digital motor control of the drives, which therefore run independently of each other
- No synchronisation of the drives necessary
- Wire buffer function available
- Forwarding of the target values relevant for the wire feeding process to the drives via micro-processor-controlled motor control units



Inside view of the eBOX

New features:

- Globally compatible wide-range input or multi-voltage connection for supply voltage
- Motherboard with modular structure, allowing operations of various types of motors (e.g. different sizes, powers or even servomotors)
- More accurate and more precise digital wire feeding with fast 32-bit control, which minimises the response times accompanying the process
- Optimised maintenance and service interfaces for user-friendly operation
- Special AIDA* eBOXes with safety relay to allow threading in of wire for service activities after a voltage drop

* AIDA: AutomatisierungsInitiative Deutscher Automobilhersteller = automation initiative of German car manufacturers

The nervous system: "MFS service software" – for complete control



Picture 1:
MFS service software homepage

The homepage of the MFS service software with direct access to all tools. All functions can be controlled from here.

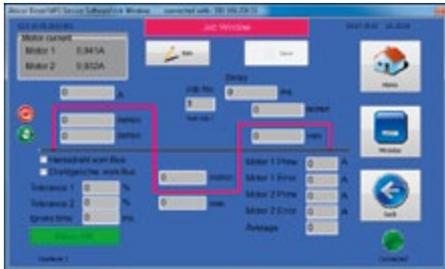
Analysis, diagnostics, documentation and maintenance

The MFS service software – the comprehensive software package for management, diagnostics, operating status display, fault evaluation and quality recording – was used even in MFS-V2. For the third version of the MFS, the tried and tested service software has been completely reworked, improved and extended with many additional functions.

As usual, the software – which is now licence-free as standard – can be used with the existing system PC in conjunction with an eBOX. As an alternative for managing several eBOX devices, the innovative MF-Control operating panel with fine and precise touchscreen is now also available, making the work of the operator much easier.

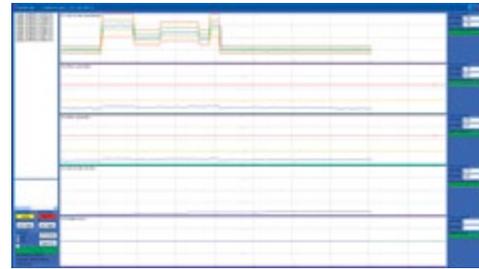
The simple and intuitive software user interface allows straightforward use of all functions. For safety, users can be given different usage rights. This is done by assigning a user level. Users can identify themselves and log in with a user login and password or alternatively with a key stick.

The option of job programming in offline mode offers a great advantage that operates independently of the robot, which prevents system standstill. This allows management of several eBOX devices at the same time with software and the MF-Control operating panel.



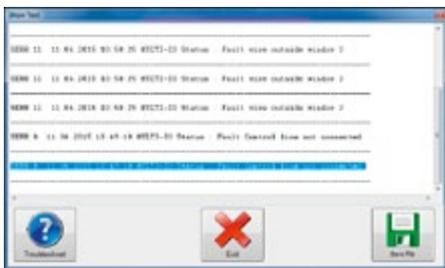
Picture 2:
Job window

Editing of up to 64 freely programmable settings in job mode and simple, graphical display of the individual jobs.



Picture 3:
Monitoring

Shows the graphical visualisation of the process parameters.



Picture 4:
Text display

Documentation and display of the faults that have occurred in plain text.



Picture 5:
Help display

Troubleshooting tool with fault description and problem solution suggestions.



Picture 6:
Service intervals

For managing and setting own maintenance intervals.



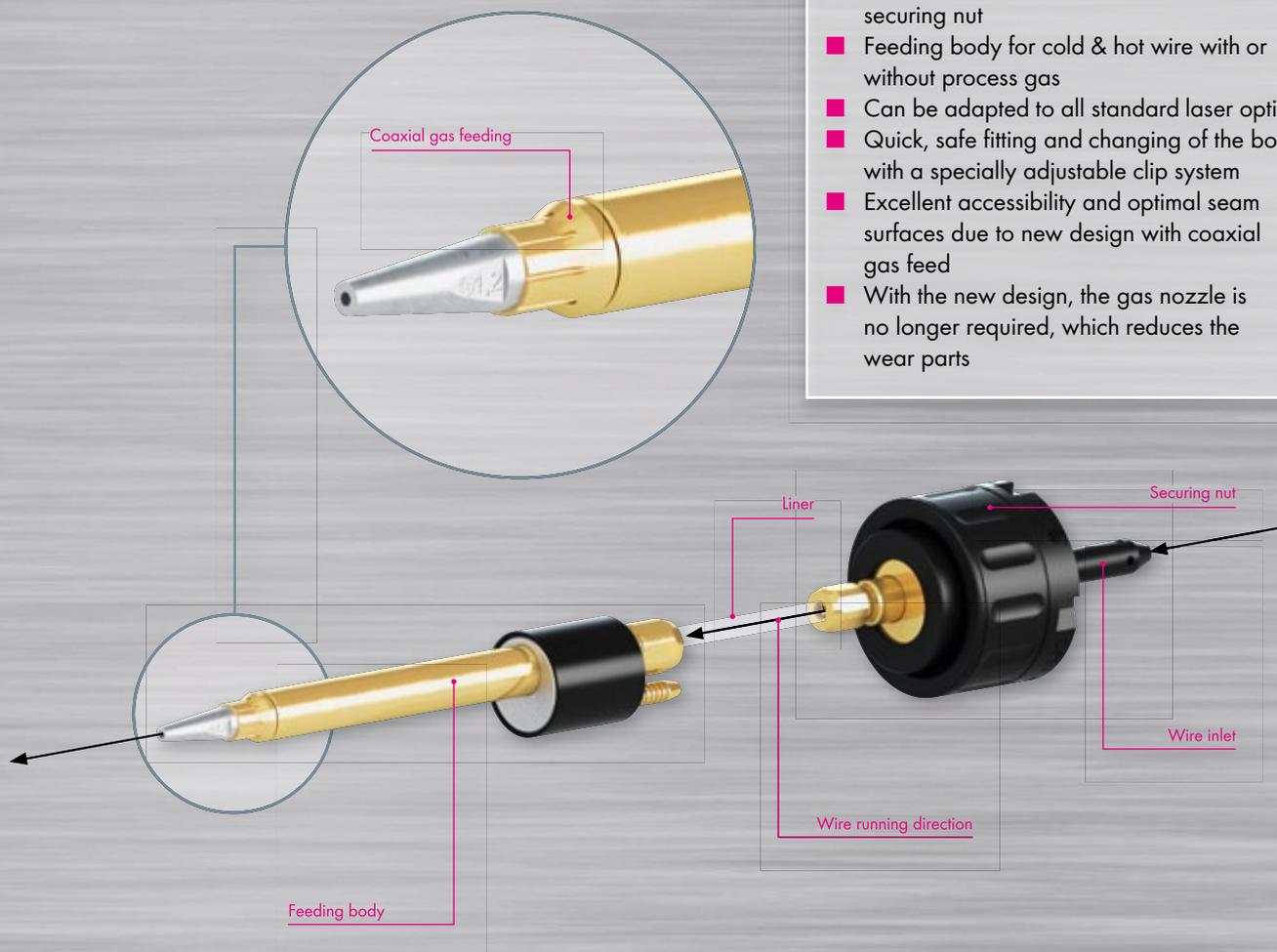
Picture 7:
Diagnostics

System diagnostics function for checking that the principal system components are functioning correctly.

The main features at a glance:

- Setting and editing of up to 64 different jobs
- Comprehensible documentation of the processes
- Fault display in plain text
- Fault log with analysis and troubleshooting
- Creation and management of freely definable maintenance intervals possible
- Diagnostics: clear system status display, which shows directly whether the system is operational or whether there is a fault
- Several eBOX devices can be given station information by assigning the IP address
- Saved station information is shown in the log files
- Multilingual user interface: six different languages can be selected (German, English, French, Italian, Polish and Spanish)
- Setting the wire buffer function
- Three user levels:
 - 0 (read authorisation)
 - 1 (authorised to load the config. files)
 - 2 (administrator rights)

The finger: "Flex supply" – close to the action!



The advantages in brief:

- Can be shortened individually due to the flexible liner between feeding body and securing nut
- Feeding body for cold & hot wire with or without process gas
- Can be adapted to all standard laser optics
- Quick, safe fitting and changing of the body with a specially adjustable clip system
- Excellent accessibility and optimal seam surfaces due to new design with coaxial gas feed
- With the new design, the gas nozzle is no longer required, which reduces the wear parts

Absolutely flexible in every respect

The Flex supply provides optimal feeding of the wire into the process and is ultimately the interface between the wire feeding system and the workpiece. It is fixed to the laser optic and thus adjusts exactly to its movements.

Essentially, the Flex supply comprises the securing nut fitted on the MF1 drive, and the feeding body with wire feeding nozzle. The connection between the two products is made by a flexible liner, which can be shortened as required. Depending on the wire diameter and material, there is also a choice of various liners and wire feeding nozzles.

The feeding body is available both for cold and for hot wire applications. The cold wire variant comes optionally with or without gas feed; the hot wire version is available with gas feeding and cooling. Here, the gas and the coolant are fed separately to the feeding body.

The latest development in the area of feeding bodies from ABICOR BINZEL ROBOTIC SYSTEMS is the product shown here with coaxial gas feed. This feature provides a reduction in wearing parts and guarantees an optimal seam surface at all times. As a result of the modified design, excellent accessibility is guaranteed

The heart: "MF1" drive – the driving force

Four rollers for maximum precision and dynamics!

The robust and powerful MF1 front drive brings the master feeder system to life. Having been developed specifically for laser applications, it scores points with its small size, light weight and variety of connection systems. It can be used individually or in conjunction with the rear drives (master pull or push-push system).

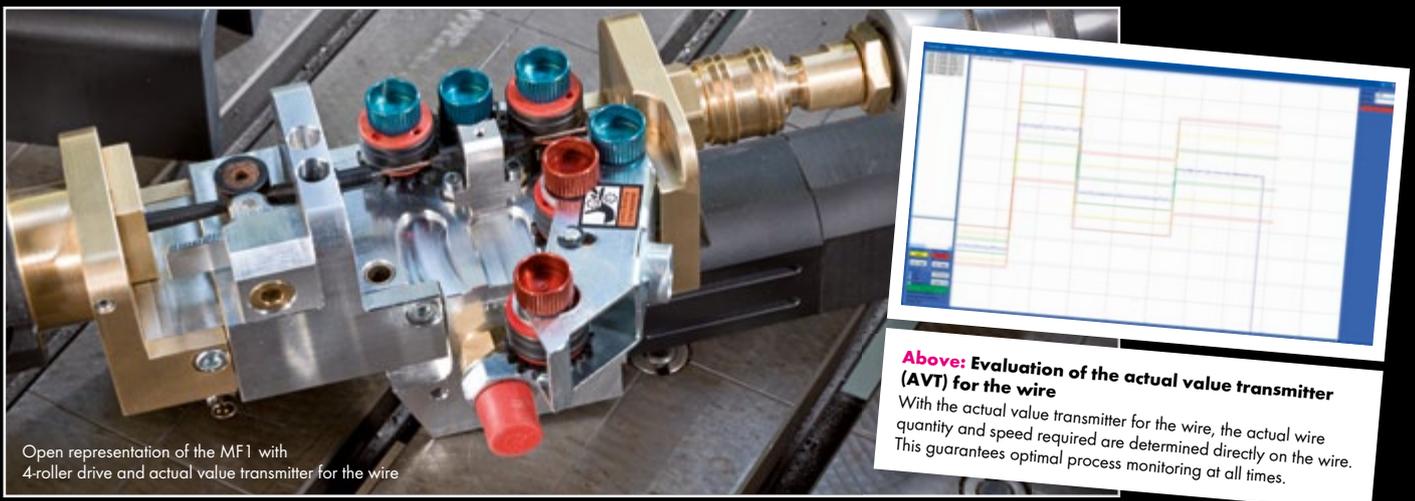
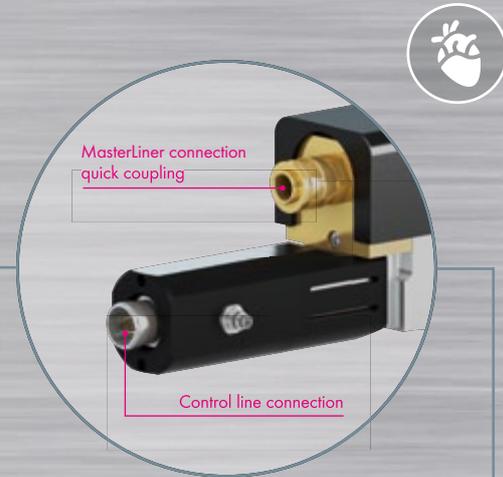
The centrepiece of the MF1 is the 4-roller drive in combination with the fast, digital motor control via the new eBOX. The 4-roller principle guarantees minimum slippage and prevents deformation of the wire as a result of pressure forces. The short acceleration and response times, which are important for laser applications, can therefore be achieved.

The drive/specification speed is monitored and controlled by a built-in encoder. In addition, the actual wire speed is determined with the aid of the actual value transmitter for the wire and forwarded to the service software. The good accessibility and the quality of the wearing parts allow quick and easy replacement of wearing parts and thus reduce down-times.

The advantages in brief:

- 4-roller drive
- Small size and light weight
- Monitoring of feeding speed by actual value transmitter (AVT) for the wire and service software
- Reworked pressure rocker for adaptation to increasing service requirements

Detailed view of back



The main artery: "MasterLiner" wire feeding hose – for constant flow



The advantages in brief:

- Low friction forces
- Long durability
- Can be cleaned by ultrasonic bath
- Maintenance free and low susceptibility to faults
- Wire feeding possible over long distances and with only one drive
- Can be used for all types of wire
- Easy, quick setup and replacement due to quick-release



Four rollers for smooth wire feeding

The products in the MasterLiner series set new standards in wire feeding. They consist of individual segments, each of which can be rotated by 360°. Four small rollers in each segment ensure smooth wire feeding with virtually no resistance.

The MasterLiner system is available in the MasterLiner and the MasterLiner MAXI designs, each in the variants HD and FLEX. The flexible FLEX version – consisting of a corrugated tube and variable connection system – allows easy, free assembly of the desired length as well as unproblematic repair directly on site. This advantage saves time and therefore also money.

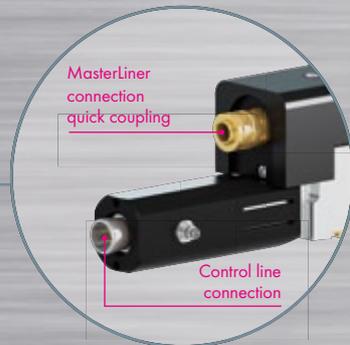
The heavy duty HD variant is sheathed in a resistant aramid fibre reinforced protective fabric and has been developed for extreme applications.

With the use of the roller-guided MasterLiner, it is no longer necessary to change electrodes – so time-consuming maintenance work on the cable assembly is avoided. In addition to the improved process stability, further potential for savings is therefore realised and the system availability is significantly increased.

The muscles (optional): Rear drives – additional power if required

Rear drive variant A "MF1-Rear"

Detailed view back



MF1-Rear

Being structurally identical to the MF1 front drive, the MF1-Rear includes also the positive characteristics of the "big brother". The two are distinguished only by the actual value transmitter for the wire (AVT), which is not required in the MF1-Rear and is therefore omitted.

The identical wear parts system makes it the perfect addition to the main drive.

Rear drive variant B „M-DRIVE“



MasterLiner connection

Detailed view back



M-DRIVE

The M-DRIVE has a large and powerful motor, which – like the MF1 master drive and MF1-Rear – is based on the 4-roller principle.

As a rear drive, its special coil carriers make it particularly suitable for wire feeding from the coil.

Double thrust for the right push

For certain applications, it is recommended to operate the MFS-V3 system with a second drive, as a push-push system, to guarantee reliable processing of the wire feeding.

One essential criterion in the decision is the length and condition of the wire feeding route. In the case of long distances or even complex routes affecting the liner management, a rear drive is critical to guarantee an even feed. The properties of the materials used are also significant. Soft wires e.g. such as aluminium require two drives, preventing any tensile forces acting upon the wire; the wire is pushed evenly and not pulled undesirably over the length. With the additional drive, the forces acting on the individu-

al components in the system are minimised and the wear is therefore reduced. The two drives are each addressed separately by the eBOX via their own control circuit, to keep the response times as low as possible. Synchronisation between the drives is therefore not necessary.

Furthermore, the wire buffer function of the system is new, which is controlled by the intake current of the rear drive. This ensures that the MasterLiner is refilled with enough wire after each cycle. This function guarantees even better wire feeding performance, particularly at the start.

The eye (optional):

“MF-Control” operating panel – everything in view



Mobile flexibility

The MF-Control operating panel is an optional component of the system and represents the mobile alternative to the system PC by which the MFS service software is usually controlled.

Whereas the system PC remains permanently installed and connected to a single eBOX in the system, the small, light operating panel is mobile and can be used flexibly for multiple eBOX devices, by plug & play via a CAN bus interface.

Furnished with a Windows panel PC, the MF-Control has a fine and precise touchscreen. With it, the full extent of the MFS service software can be used. In addition to the familiar functions such as process

monitoring and fault analysis, further features that make the work of the user much easier are available via the operating panel.

All the eBOX devices used can be managed with the MF-Control. It is possible simply to change process parameters in job mode or to create new jobs in offline mode then to load them to the respective eBOX when a connection exists.

The MF-Control operating panel is therefore a helpful component of any servicing and maintenance department.

Behind the scenes:

Technical data

eBOX Programme versions and functions

Programme / file name	AIDA	Safety relay	Hot wire compatible	Autodetect MF1-Rear	Master drive	Slave drive	Job functionality	Wire buffer function
Programm 1	+	+	+	+	MF1	MF1-Rear	+	+
Programm 2	+	+	+	-	MF1	M-DRIVE	-	-
Programm 3	+	+	+	+	MF1	MF1-Rear	+	+
Programm 4	-	-	-	-	MF1	MF1-Rear	-	-
Programm 5	-	-	+	+	MF1	MF1-Rear	+	+
Programm 6	-	-	+	-	MF1	M-DRIVE	+	+
Programm 7	-	-	+	-	MF1	M-DRIVE	-	-
Programm 8	-	-	-	-	MF1	M-DRIVE	-	-

Technical data

eBOX:

Dimensions (WxHxD):	685 x 385 x 214 mm
Weight:	21.5 kg
Supply voltage:	100 - 240 V AC / 50 or 60 Hz
Internal operating voltage:	24 V DC / 38 V DC
Power input:	1.0 kW
Protection type:	IP21
Ambient air temperature:	-10°C to +40°C
Relative humidity:	Up to 90 % at 20°C

MF1 und MF1-Rear:

Weight:	Approx. 2.9 kg
Ambient air temperature:	-10°C to +40°C
Relative humidity:	Up to 90 % at 20°C
Max. welding current:	500 A at (100% ED)
Max. wire feeding speed:	i= 15/1 v= 0 - 20 m/min, i= 30/1 v= 0 - 10 m/min*
Roller diameter:	20 mm
Drive:	4 rollers
Protection type:	IP23
Nominal voltage:	38 V

M-DRIVE:

Dimensions (WxHxD):	400 x 207 x 225 mm
Weight:	Approx. 13 kg
Ambient air temperature:	-10°C to +40°C
Relative humidity:	Up to 90 % at 20°C
Supply voltage:	38 V DC
Max. welding current:	500 A at (100% ED)
Max. wire feeding speed:	20 m/min
Roller diameter:	30 mm
Drive:	4 rollers
Wire feeding connection:	Euro-ZA quick coupling
Protection type:	IP21

Service software:

System requirements:	PC (notebook) with processor from Pentium III (500 MHz)
Working memory:	Min. 64 MB RAM
Disk space required:	Min. 100 MB
Operating system:	Microsoft Windows (Windows 7 or XP)
Connection:	USB 2.0 or Ethernet

MF-Control:

Dimensions (WxH):	270 x 246 mm
Processor:	Intel Atom N2600 CPU
Memory:	2 GB DDR3
Mass memory:	30 GB MLC SSD
Operating system:	Windows 7 Embedded
Connections:	Ethernet and USB 2.0 (outside on case) MF-Control connection to eBOX via CAN bus
Supply voltage:	24 V DC

MasterLiner MAXI HD:

External Ø:	32.0 mm
Wire Ø:	1.2 mm to 4.0 mm
Weight:	Approx. 540 g/m
Min. bending radius:	150 mm
Stretch / tensile strength:	1,500 N
Connection:	G 1/4" or quick connector

The technical data of the other MasterLiner versions (MasterLiner HD & FLEX and MasterLiner MAXI FLEX) are shown in the current complete catalogue of ABICOR BINZEL ROBOTIC SYSTEMS.

*The tolerances are dependent on the speed selected and on the respective control.



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